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2008

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### Recommended Citation

Navarrette, Carlos J. and Guthrie, Ruth A., "Challenges in Teaching Large Online Sections" (2008). *AMCIS 2008 Proceedings*. 377.  
<http://aisel.aisnet.org/amcis2008/377>

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# Challenges in Teaching Large Online Sections

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## ABSTRACT

This paper presents a case of a campus based online teaching experience. The case is based on a Management Information Systems course for large sections in two modalities: online and hybrid settings with 30 and 70 students respectively. The purpose of the project is to identify the challenges in teaching large online sections. The main results are that given the current technology, we can overcome the class size limitations for on-line courses; that according to active learning experiences, we can use active learning recommendations in online course design; that given technologies like Blackboard and Breeze, students' expectations and needs can be properly fulfilled with large sections; that given differences in course goals, only cognitive based courses can take advantages of online teaching; and that given the characteristics of a Management Information Systems course, it can be taught online. These results are important for researchers, professors, and university authorities.

## Keywords (Required)

Online teaching, e-learning, distance learning, large and mega courses

## INTRODUCTION

Large sections are not new to university teaching. Horror stories of 500 students in Astronomy 101, taught by a teaching assistant are easily found. There is also a wide body of research about large sections and an accumulation of knowledge about how to achieve a small classroom experience when teaching a large section. Not surprisingly, large sections are offered in online and hybrid formats.

This paper documents a case study of a Management Information Systems course for large sections (70 students) that was offered in three formats, face-to-face, campus based online (CBO), and hybrid. (CBO means that the student is enrolled in traditional courses concurrently with online courses.) The case presents how the course was planned, designed, and implemented; and how this implementation affects student learning, student satisfaction, faculty work-load, and course support issues. Other topics such as sustainability and cheating are also discussed. The lessons learned from this case are used in discussion on how to face the challenges of teaching large, online sections.

A study of the challenges of teaching large classes is necessary as the popularity of online courses continue to rise. There are indications of a change in students' acceptance of online courses, and a change in online teaching options. Increasingly, universities offer distance learning, CBO, and hybrid courses. These offerings respond to the growing demand of this type of educational experiences by undergraduate and graduate students.

## BACKGROUND

The first course offered online was at New York Institute of Technology (NYIT, 1984.) The class was offered as part of the American Open University in order for people without access to NYIT's three campuses to attend classes. At that time, critics of online education, compared classes to correspondence courses and courses by mail offered to earn one's high school diploma. The research focus became a comparison of the merits of traditional versus online teaching. As a result, there is a plethora of research that shows evidence that online students learn as well as students in traditional courses. This remains an ongoing argument. However, most scholars agree that the focus should be on how technology can promote student learning, not whether online teaching is good or bad (Salter, 2003).

There are two lines of research relevant to this study. One, online teaching modalities, advantages, disadvantages, success conditions, impact of learning, and student and faculty performance; and two, large sections impact on learning, teaching load, student performance, and impact on university facilities. Table 1 presents research relevant to this study grouped according to the impact on students, teachers, courses, and administrators.

Several authors are reporting different dimension for the success of both on-line and traditional teaching. For example, Rowley and Cole (2002) assert that learning is a consequence of *proper design*, and Clark and Mayer (2005) suggest that the *instructional method* causes learning not the media. Even more, Duhaney (2004) proposes that a *correct blend* of on-line and face-to-face will produce the best learning results.

Impact	On-line	Face-to-face
Teachers	Can reuse course materials (Neumann, 1998) May demand the ownership of the course materials (Neumann, 1998) Workload increases by a factor of 2.5 (Dibiase & Rademacher, 2005)	Have the ownership of the course materials (Neumann, 1998.)
Students	Are less satisfied with the course (Kartha, 2006) Are less satisfied with student interaction (Kartha, 2006) Can cover the materials any time any place (Neumann, 1998) Can find it more suitable if they are older (Neumann, 1998) Performed as well as face-to-face students (Kotey and Anderson, 2006)	Are more satisfied with course (Kartha, 2006.) Are more satisfied with student interaction (Kartha, 2006) Interactions reinforces understanding of course concepts (Hazari, 2004)
Courses	Materials design is not trivial (Neumann, 1998) Materials designing is time consuming (Neumann, 1998) Planning and designing efforts are much more demanding (Neumann, 1998) Updating is critical for the sustainability of the course (Neumann, 1998) Can not be suitable to all courses (Neumann, 1998) Eliminate advantages of traditional teaching (Neumann, 1998) Demand for online is 14% higher (Tomei, 2006) Ideal class size is 12 students (Tomei, 2006) Are excellent for academic goals that require cognitive learning (Taylor, 2002)	Planning and designing efforts are less demanding (Neumann, 1998) Demand was more stable (Tomei, 2006) Ideal class size is 17 students (Tomei, 2006) With large size outperformed small ones on final exam (Callahan Hill, 1998) Overall evaluation not related to class size (Callahan Hill, 1998) Are better for programs that aims to change students attitudes (Taylor, 2002)
Administrators	Could see it as a solution to large sections (Neumann, 1998) Could see it as a solution for lack of qualified instructors (Neumann, 1998)	

**Table 1. Online vs. Face-to-face Teaching**

Previous research on how to teach large sections emphasizes the challenge of securing student participation when the section has more than 100 students. Frederick (1987) recommends five different ways to *secure active learning*: Delivering interactive presentations, securing questioning, dividing the large section into small groups, using critical-thinking and problem-solving assignments, and experimenting with role playing activities. This author claims that by adopting these practices teachers would succeed regardless of whether class size is 50, 100, or 500 students.

Effective teaching-learning processes have to solve the challenges of combining two dimensions: learner characteristics and course subject. Teachers design courses or learning experiences based on how people learn (Bransford et al., 2000), different learning styles, and other learners' characteristics such as age, gender, and previous education. Svinicki (2004) proposes to combine cognitive theory, concept learning theory, and constructivist theories to enhance learning. The second dimension, the subject of the learning process, is even more diverse. In the case of on-line teaching, Taylor (2002) suggests that on-line

courses are suitable for course calling for cognitive learning where content require memorizing, problem solving, and inference processes, but are inadequate for courses that aim to promote participants attitude or cultural changes. Additionally, Tham and Werner (2005) propose that problem-based learning is one approach to secure student learning. The role of the teacher in this learning setting is to guide the process and encourage students to apply problem-solving strategies.

Our objective in this study was to follow previous research findings as guidelines for the design of our online course, and to identify the challenges resulting from this design on large sections.

**METHODOLOGY**

Using a case study methodology, this project aims to answer the following research question: How do you effectively teach large sections on-line? The project’s working propositions are as follows:

- Given the current technology and innovative course settings, we can overcome the class size limitations of on-line courses.
- Management Information Systems is a cognitive based subject and can be learned via online instruction.
- Students can be properly served in large sections.
- Large online courses will have no negative impact on faculty workload.
- An on-line course can be sustainable without major investments in time and effort.

In order to answer the research question and to find evidence to support the study propositions, the following steps were carried out:

1. **Research framework design.** Figure 1 presents the research framework of the study. This framework is based on the literature review of online and large sections teaching experiences. We used this framework to guide the comparison of the impact of face-to-face and online teaching on the course, students, teachers, and administrators. This comparison is presented in the case analysis section.

Entity	Face-to-face	Online/hybrid
Course	Impact of section size Suitable to behavioral courses Course design and delivery	Impact of section size Suitable for cognitive courses Requirements for course sustainability Course design and delivery
Students	Impact of large sections in student learning Cheating problems Satisfaction with education experience	Impact of large sections on student learning Cheating problems Satisfaction with education experience
Teachers	Impact on faculty workload Ownership of course materials Individual and collaborative teaching	Impact on Faculty workload Ownership of course materials
Administrators	Impact of university economics Promoting learning centered education	Impact of learning centered education Solving ownership problems Solution to large sections’ problems

**Figure 1. Research Framework**

2. **Case.** The case of the adoption of online teaching was documented according to course background, course design and development, and course implementation experience.
3. **Case analysis.** Using the research framework, the case was analyzed assessing the impact of online teaching on course, students, and faculty. Then the case results were used to answer the research question and the study’s prepositions. Last, these results were compared with findings reported in the literature.

The case study methodology used in this study is suitable to exploratory, descriptive or explanatory research, where the researcher aims to answer “how?” or “why?” questions (Rowley, 2002.) According to Yin (1994), case studies are

recommended when the researcher has no control over events of the research project. One strong limitation of the case study methodology is the lack of statistical generalizability. However, case studies rely on analytical generalizability (Yin 1994.)

**THE CASE**

California Polytechnic University, Pomona (Cal Poly) is a large, urban campus focusing mainly on undergraduate education. Cal Poly is part of a 23 campus, California state college system. Of Cal Poly’s 20,000 students, the College of Business Administration has 4,200 students, making it the second largest college of the University. The campus has always prided itself on ‘learn by doing’ education and Cal Poly is known for its hands-on approach to learning.

The Management Information Systems (MIS) course is a core course that every business student is required to take and is administered by the Computer Information Systems (CIS) department of the College of Business. MIS is a survey course that gives students exposure to how information systems are used in organizations. Cal Poly is a quarter-based university, so the MIS course is given over a 10 week term. A typical class size is 70 students and 5 or 6 sections of this course are offered each term. Table 2 presents the main characteristics of the face-to-face course.

Course Topics	Projects	Tests
<ul style="list-style-type: none"> <li>• Overview of Information Systems in Business</li> <li>• Strategic Use of Information Systems</li> <li>• Databases and Data Warehouses</li> <li>• Decision Support Systems</li> <li>• E-commerce</li> <li>• Systems Development</li> <li>• IT Infrastructure</li> <li>• Integrity, Privacy and Security</li> <li>• Future Trends and Emerging Technologies</li> </ul>	Database Spreadsheet E-commerce Security	Midterm Final

**Table 2. Face-to-face CIS 310 Characteristics**

The traditionally offered face-to-face MIS course had several problems. The course was perceived as an ‘easy A’ by students, CIS faculty did not like teaching the MIS course, attendance was low and finding rooms for classes to meet was difficult. The reputation of the traditional MIS course was that it was easy to pass, even if you never attended class. Another problem was that the course is viewed as a low-status, survey course by the CIS faculty. CIS faculty would rather teach upper division CIS courses with more technical content. The result was that many sections of the MIS course were taught by adjunct faculty, who’s student evaluations impacted their employment, causing them to be lenient in their grading practices. Further, finding appropriate classroom space for a large course like this was a strain on Cal Poly’s resources.

To solve the room availability problem, a ‘mega-section’ of the MIS course was offered in the University recital hall, which could seat 170 students. Because the room was poorly lighted and had no Internet access, few students attended. To improve attendance, an electronic clicker system was adopted. An Internet connection was made available in the recital hall and now the instructor could take attendance, give quizzes and exams via clickers, reducing faculty workload in maintaining a grade sheet. This instructor was very successful and popular with administrators. A section with a 1 to 170, faculty to student ration is extremely efficient. However, other faculty did not want to teach the course this way. When the faculty member retired, the course quickly returned to its former mode of low attendance and lack of interest.

**Design & Development**

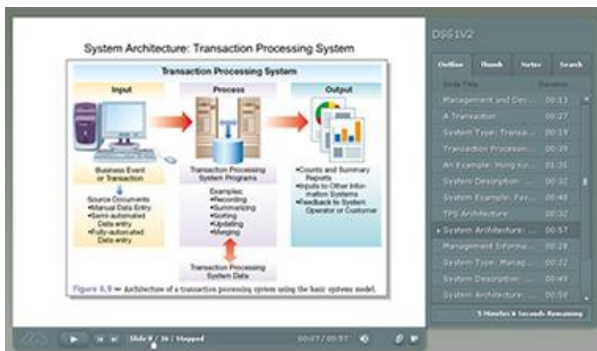
During the summer of 2006, Cal Poly offered incentives to faculty for development of online courses through a Distance Online Learning Centered Environments (DOLCE) program. The criteria for winning the stipend was that the course developed have large enrollment, be sustainable, have clear success measures, and that faculty attend an online learning academy to learn the pedagogy of online teaching. The MIS course team consisted of four faculty members, with different lines of research in MIS; an instructional designer; and a subject librarian. Faculty participants each received a \$4000 stipend for their efforts.

The team met once a week to talk about developing the hybrid version of the course. In general, the course would follow a book for the ten modules listed above. Modules would be delivered via Blackboard, the university online learning system. Faculty would develop online lectures for each module. The faculty agreed that each team member would develop two modules, related directly to a chapter in the text book. Faculty brainstormed about what should be included in each section of the course and then reviewed texts for adoption. The selection of the text was very important because the team planned to use the PowerPoint presentations and the test bank prepared by the publisher. The time savings to faculty was great. However, the team realized that basing a course on a specific text made updating the course and switching text books very difficult. This was an obstacle to sustainability. As new organizational information systems trends develop, the old text would become dated.

Given the advantages and disadvantages of using a textbook and the development time frame, the decision was made to select Information Systems Today by Jessup and Valacich (2006). Team members break their modules into sub-modules and define the title and what materials were needed to create each sub-module. The team identified whether the materials would be purchased, borrowed or created. Faculty learned to use Breeze (now Adobe Connect) to develop their modules. Breeze features allowed faculty to:

- Use a simple microphone and PowerPoint, with a Breeze plug-in, to record their voices.
- Edit the audio using a simple editing tool.
- Embed quizzes into Breeze lectures so the student would have to answer before continuing (the quizzes did not count towards the student’s grade because of incompatibility problems with Blackboard). This feature also helped to keep student attention.
- Embed video examples into the Breeze lectures.

Figure 1 shows the Breeze interface and some of the features listed above.



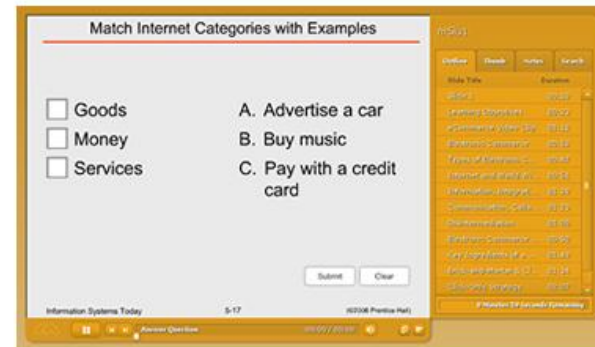
**Breeze Interface**



**Interactive Surveys**



**Embedded Flash Video**



**Real Time Quizzing and Feedback**

Figure 1. Breeze Interface Examples

Table 3 presents the structure of the online/hybrid course. The elements of the design had ramifications for academic rigor, student cheating, faculty workload and student support. In the hybrid course design, students would listen to the Breeze

lecture for the week, coming to class prepared to work on and present a case. This design freed the faculty member from lecturing about the text and gave them the opportunity to create more student engaged activities when the class met. Another feature was that the enrollment for this MIS course is 70 students. Creating a hybrid course allowed the instructor to divide the class in two groups. If the class met Monday and Wednesday, half of the students were in Monday’s face-to-face class and the other half was in Wednesday’s. If a student missed their assigned day, they could attend the other day. The smaller class size for the face-to-face meetings created more quality opportunities for student interaction. Using cases gave the students a chance to apply course knowledge to a real world problem. It also satisfied the need for them to practice writing and presentation skills. Exams would be given face-to-face to control for student cheating.

Course Modules	Projects	Team Cases	Tests
<ul style="list-style-type: none"> <li>• Information Systems in Business</li> <li>• Strategic Use of Information Systems</li> <li>• Databases and Data Warehouses</li> <li>• Decision Support Systems</li> <li>• E-commerce</li> <li>• Systems Development</li> <li>• IT Infrastructure</li> <li>• Integrity, Privacy and Security</li> <li>• Future Trends</li> </ul>	<p>Database: Access database for fictitious charity.</p> <p>Decision Support System Spreadsheet: analysis of compensation problems and solutions</p> <p>Web page: MySpace Digital Dashboard</p> <p>Security: Tools and utilities for personal computer security.</p>	<p>Taco Bell</p> <p>Airline Industry</p>	<p>9 quizzes</p> <p>Midterm</p> <p>Final</p>

**Table 3. Online/Hybrid Course Structure**

Four assignments were created to give students a hands-on experience with technology. Microsoft Access was used to give students experience with a database, an excel assignment let students used decision support systems, students were required to build a small Web page using MySpace or LiveSpaces and students were required to test the security on their own computers.

**Online/hybrid Course Implementation**

The online course was a little different than the hybrid course. First, students needed an orientation session to find out how to access their class and introductory information about the course. Online students also needed classroom space to take exams face-to-face. Online students would be organized into teams to work on the cases. They would upload their case presentations and papers to Blackboard.

Given the large number of students, faculty would be very busy answering questions about assignments and grading. A pool of teaching assistants was assigned to the course. The teaching assistants would keep lab hours (60 hours per week) so that students could visit them, especially the day before the assignment, to answer questions. The teaching assistants were given detailed rubrics to score the assignments that were uploaded to Blackboard. The instructor would grade the projects using the rubric and the student report. This, in theory, freed the faculty member to answer questions about the cases and technology in business, rather than questions about how to use office automation software. The students were also better served because the teaching assistant pool had more generous availability than the instructor. Another way to support students was to give online quizzes for each module. Students could re-take the quizzes until they scored 100%. This re-enforced their understanding of the lecture. The online quizzes were worth very few points, compared to the exams. Online tutorials for the assignments were also made available to students.

The MIS course was first offered in the Fall of 2006 in online and hybrid formats. Several problems with the online course surfaced quickly. The orientation sessions for the online course were scheduled in the morning and late afternoon so that all students could attend. However, many students did not know where the face-to-face orientation sessions were given. The room scheduled for the orientation did not have a computer or projector for the instructor to use to demonstrate how to take the course. No computers were provided for students, so they could not attempt to log on and try the introductory lecture. To

resolve this problem, an online orientation session was developed using a Breeze lecture and screen shots of the course. This session became module 0 of the online version of the course. Every student received an email message prior to the course, instructing them how to listen to the orientation.

Originally, to discourage cheating, the team decided to offer all the exams on campus using paper copies of the exams. Again, finding an appropriate room to give the exams to large groups of students was a problem. Exams were given in rooms that were too small, dimly lit and desks or seats without proper writing support. The structure of the University scheduling system was set up so you could only schedule a classroom if you required it for an entire course. Very little support was available to solve these problems. For this reason, exams were given entirely online. The exams were randomized and had a very strict time limit. This forced students to study rigorously even though it was an online, open book, open note exam. The first online exam was set up so that students could only log into the exam once. This created problems when internet connections failed or students accidentally shut the exam window. The exam was then left open but, with a strict two hour limit. Blackboard could not enforce a time limit if the exam was left open. However, if a student went over the limit, their exam couldn't be graded until the instructor viewed it. Students who went over the time limit were docked points or had to retake the exam.

Other technological problems arose when students tried to upload assignments. If they uploaded only one of the two required files for the assignments or uploaded the wrong file, they could not edit their assignment after they uploaded. This was so frequent, and the interface was so non-intuitive that two upload links were created to have students upload the files separately. Later, in the orientation was changed to warn students about this problem. Students were also often locked out of the online quizzes. The only way to solve this problem was to have the instructor manually go into the grade book and reset the quiz. The grade book had problems too. Blackboard allows the instructor to set up weighted categories or points towards the grade. However, when the weighted categories were used, the student view of their grade was rounded, giving them the wrong totals. When the points were used, the wrong total was also displayed because the quizzes were 20 questions, worth 5 points. The grade book gave the student 20 points, showing them the wrong grade again. During the orientation, students were shown how to calculate their grade.

Cases were used during the first term this course was offered. The online classes had to work in online teams while the hybrid classes would present the cases during class. The cases were too challenging for the undergraduate students in the online teams. Students were given an option to 'fire' non-performing members of their teams. Just the opposite occurred, several online students wanted to work alone, preferring to 'opt out' of their team instead of do group work. This was not allowed. The cases were dropped from the course.

Teaching assistants were used to help students with assignments and as scores for the assignments. Appropriate candidates (students who did well in the course and knew how to use Blackboard) were identified, trained and monitored. The use of a detailed rubric made grading equivalent across sections of the course. Having the students available in an on-campus lab was overwhelmingly successful. Often, the day before the assignment was due, the lab was very busy with students seeking help. The teaching assistants were able to grade assignments quickly and using the rubric, give students meaningful feedback online.

As time progressed, more problems with the course were solved. Eventually, other faculty members were assigned to teach the course online. The teacher learning curve for the course was very low. With very little instruction on Blackboard, new faculty could monitor the course. Not having to prepare a lecture or spend a great deal of time on grading, freed their time for other work.

## **CASE ANALYSIS**

In this section we use our research framework (Figure 1) to compare the online to face-to-face modalities. This case demonstrated that online courses require more planning and design effort than face-to-face settings. The implementation of such courses present so many dimensions that it is advisable to test all course elements and to pilot the entire course before adopting the course material in online or hybrid courses. These results are aligned with Neumann's (1988) warning regarding online teaching. The main contribution of our experience is the collaborative approach we used for the project. By dividing the course among professors according to their research expertise not only made the project feasible, but also secured high quality in the content and the designed academic experiences.

The collaborative design aimed to secure efficient learning in large sections. The design of the online course included four of the five Frederick (1987) recommendations for teaching large sections. The online course asks for student to have interactive participation, answer quizzes and getting instant feedback, participate in small group to solve business cases, and solve assignments that require critical-thinking and problem-solving skills. According to Tomesi (2006) ideal size for face-to-face and online settings are 17 and 12 students, respectively. However, we taught much larger sections successfully using



technologies such as Blackboard, and Breeze, with the results pointed out by Meiselwitz (2002). Our experience support our first proposition: Given the current technology and innovative course setting, we can overcome class size limitations. Table 4 presents the number of students taking the course according to the three modalities: Face-to-face, hybrid, and CBO. Starting on winter 2007, we have been teaching online sections with 68 or more students.

Quarter	Face-to-face	Hybrid	Online
Fall 2006	166	139	30
Winter 2007	129	184	68
Spring 2007	103		317
Summer 2007	106		85
Fall 2007	108		245
Winter 2008	206		180
Spring 2008	220		159

**Table 4. Number of Students by Teaching Modality**

The case also demonstrates that Management Information Systems is a subject that requires cognitive learning. Taylor (2002) state that online course are excellent for academic goals that require cognitive learning such as content memorization, problem solving, and inferences. On the contrary, this author suggests that face-to-face courses are better for programs that aim to change students attitudes. Taylor's recommendations match our experience with online delivery: we were successful with cognitive tasks such as problem solving project assignments, but we failed with student attitude-and-behavior-changing tasks such as the business cases assignments, which require students to develop teamwork and leadership skills. This result also agrees with Taylor (2002) who concluded that face-to-face teaching is better for goals that aim to change student attitudes. Still the experience support our second proposition: MIS is a cognitive subject and can be learned effectively via online instruction.

Besides the problem with the business cases, students' acceptance of the online version of the course has surpasses our expectations. Students prefer the online option to the hybrid version. The online sections fill first compared to other options. Faculty always have a waiting list for students wanting to add the course. Our experience contradicts Kartha's (2006) findings. According to this author, students are less satisfied with an online statistics course, student are more satisfied with the face-to-face version of the course. Specifically, online students missed the interaction opportunities of face-to-face courses. Contrary to this perception, in our course having the opportunity to cover the materials anytime anywhere, and having more flexibility arranging schedules makes the online course very popular. Providing ample TA support for students may have been a factor in student satisfaction.

Regarding students performance, our findings show no significant differences in grades from hybrid and online sections. This finding is aligned with Kotey and Anderson (2006) research. These authors state that online students performed as well as face-to-face students. Our experience with online and hybrid courses clearly support our third proposition: Students can be properly served in large online sections.

One negative experience regarding students' behavior in online teaching is that we faced cheating and plagiarism problems. The most common problem relates to students presenting other student work as their own. Even though the number of cases was small (2 out of 70 students), we are promoting an information forensic procedure to identify file ownership, date of file creation, and content comparison of all files submitted by students across all online sections per quarter, including previous quarters. Traditional courses face exactly the same problem.

The impact of online/hybrid courses on teachers presents mixed results. In the case of workload, for example, it is clear that for the four faculty members taking part of the project the work load increased considerably. The team invested close to 1000 hours in planning and designing the online course. This effort included module materials, tutorials development and testing, project design and testing, quizzes definition, and test design. It is worth mentioning that this effort was lower thanks to the use of the textbook supporting materials. Also, our perception is that the teaching effort required for managing the online/hybrid versions of the course is different, but it is comparable to the effort invested in the face-to-face course.

For faculty members teaching the course, adopting the online version has presented a tremendous savings because of the reduce preparation, teacher assistants availability, colleagues' support if needed, and the university's online oriented infrastructure. Our findings concur with Neumann's (1998) expectations for online teaching. This author points out that online teachers can reuse course materials. However, our findings make us agree with Dibiasi and Rademacher (2005) who's conclusions show that teaching workload increases by a factor of 2.5 for online courses. These results contradict our fourth and fifth propositions: Large online courses will have no negative impact to faculty workload, and an online course can be sustainable without major investment in time and effort.

The online/hybrid experience at Cal Poly demonstrates the critical role of the university administration in online teaching success. Cal Poly promoted the DOLCE program, created an IT support unit for online teaching, invested in all the technologies required to excel on learning centered education, and in our case accepted to pay for the course teacher assistance expenses. Without such commitment any online teaching initiative would suffer.

## CONCLUSIONS

This paper presented a case of a CBO/hybrid course for large sections. The main results are that given the current technology, we can overcome the class size limitations of on-line courses by designing the online course to secure active learning. Active learning can be promoted with interactive presentations, frequent questioning, dividing the large section into subgroups of 5 or 6 students, and problem-solving assignments. With such a design and technologies like Blackboard and Breeze, students' expectations and needs can be properly fulfilled with online large sections. Unfortunately, not all the courses can use online settings. As reported in previous research and as found in our experience, only cognitive-based courses can take advantage of online teaching. Consequently, since Management Information Systems is a cognitive-based subject, therefore, it can be learned via online instruction.

The costs of the above benefits are that large online courses have a negative impact on faculty workload, and that on-line courses cannot be sustainable without major investments in time and effort. Summarizing, the main challenges in teaching online sections are: university support, technology availability, IT support staff availability, faculty workload, course design for active learning, and course's cognitive based content.

The results and lessons learned in this study are important to faculty exploring adoption of online teaching for ideal size or large sections, and to university authorities willing to promote online teaching to secure learning centered education. One limitation of the project is that is based on only one case. More experiences online experiences with large sections are required to be able to generalize our findings.

We consider it critical to investigate a full online collaborative teaching approach. Our case is based on collaborative design and individual delivery. In the future, we want to find the impact on the course, students, and faculty of a collaborative design and collaborative delivery. In our case, this will translate into four professors teaching a class with 350 students.

Similarly to other industries, information technology has already changed education. The adoption of campus based online teaching is only one of several e-education alternatives, and it is very promising for learning-centered education. On the negative side, however, online teaching requires expensive resources –money, technology, and time.

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